(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 3 441 102 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
13.02.2019 Bulletin 2019/07

(21) Application number: **17190640.7**

(22) Date of filing: **12.09.2017**

(51) Int Cl.:
A61M 16/16 *(2006.01)* ***G01F 23/76*** *(2006.01)*
A61M 16/10 *(2006.01)*

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA MD

(30) Priority: **10.08.2017 TW 106127095**
10.08.2017 TW 106211831 U

(71) Applicant: **Ningbo Besmed Medical Equipment Corp.**
Beilun District
Ningbo Zhejiang (CN)

(72) Inventors:
- **HSIUNG, Tao-Tsun**
  New Taipei City (TW)
- **WANG, Xu-Xiang**
  New Taipei City (TW)
- **TSAI, I-Chen**
  New Taipei City (TW)

(74) Representative: **Stolmár & Partner**
Patentanwälte PartG mbB
Blumenstraße 17
80331 München (DE)

(54) HUMIDIFICATION CHAMBER HAVING SUSPENSION TYPE FLOAT

(57) A humidification chamber having suspension type float, the humidification chamber comprises a shell body, a water level control valve and a heated plate; the shell body has a water inlet, a gas inlet and a gas outlet; the water level control valve is provided with a position limiting element, a float and a sealing sheet; wherein the sealing sheet is disposed on a top end of the float, the heated plate is used for sealing the shell body to form a chamber space; when a liquid enters into the chamber space by a water inlet hole of the water inlet, the float will rise to comply with the water level increasing; when the sealing sheet contacts the water inlet hole of the water inlet, the sealing sheet can block the water inlet hole of the water inlet; when the water level of the chamber space is fell down, the position limiting element can prevent a bottom of the float from contacting the heated plate.

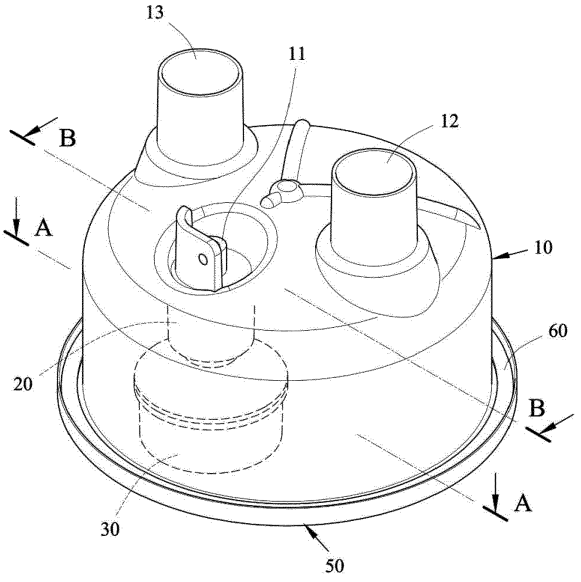

FIG. 1

EP 3 441 102 A1

Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a humidification chamber and more particularly to a humidification chamber having a water level control valve, the water level control valve is provided with a float. During the humidification process, the humidification chamber will consume a liquid which contained in the humidification chamber; when the liquid is added to the humidification chamber, the float will rise to comply with the water level increasing. The water level control valve can block a water inlet of the humidification chamber, therefore the water level control valve can control the water level of the humidification chamber.

2. Description of Related Art

[0002] A prior-art is disclosed in US Patent No. US7722016 (its patent family has Australia Patent No. AU2007290261B2, European Patent No. EP2056912A1, Japan Patent No. JP5398868B2, PCT Patent No. WO2008027670A1), the prior-art disclosed a humidification chamber, the humidification chamber has a float, the float has a seal element which is movable into and out of a valve seat; when the water level of the humidification chamber exceeds a first level, the seal element will seal off a water inlet; when the water level of the humidification chamber is below the first level, the seal element will open the water inlet; the float has a stand-off rib to prevent the lower end of the float from contacting a heat conductive plate.

[0003] The stand-off rib of the float may still be in contact with the heat conductive plate when the water level of the humidification chamber is too low. Moreover, the stand-off rib of the float may still be in contact with the heat conductive plate when the water inlet does not replenish water into the humidification chamber (e.g., a water storage container connected to the water inlet has no water). Thus, the prior-art still requires improvement.

SUMMARY OF THE INVENTION

[0004] It is therefore an object of the invention to provide a humidification chamber having suspension type float, the humidification chamber comprises a shell body, a water level control valve and a heated plate; the shell body has a water inlet, a gas inlet and a gas outlet; the water level control valve is provided with a position limiting element, a float and a sealing sheet; wherein the sealing sheet is disposed on a top end of the float, the heated plate is used for sealing the shell body to form a chamber space; when a liquid enters into the chamber space by a water inlet hole of the water inlet, the float will rise to comply with the water level increasing; when the sealing sheet contacts the water inlet hole of the water inlet, the sealing sheet can block the water inlet hole of the water inlet; when the water level of the chamber space is fell down, the position limiting element can prevent a bottom of the float from contacting the heated plate.

[0005] It is therefore another object of the invention to provide a humidification chamber having suspension type float, the humidification chamber comprises a shell body, a position limiting element, a float and a heated plate; the shell body has a water inlet, a gas inlet and a gas outlet; an inside of the water inlet has an extending tube, an inner wall of the extending tube has a plurality of guiding ribs; the position limiting element has a through hole and an inner edge, the inner edge has at least one notch; an extending portion of the float has at least one hook, a top end of the extending portion is provided with a sealing sheet; the heated plate is used for sealing the shell body to form a chamber space; wherein the extending portion can pass through the through hole, the hook can pass through the notch, and the float can be rotated to an angle, therefore the hook can be located at an inside of the inner edge; the position limiting element can be fixed on the extending tube, therefore the hook and the notch can be separated by the guiding ribs.

[0006] First advantages of the invention include the float can be suspended on the position limiting element when liquid replenishment of the chamber space is not enough, that will form a distance between the heated plate and the bottom of the float. When the chamber space has no liquid at all, the bottom of the float still does not contact the heated plate.

[0007] Second advantages of the invention include the top end of the float is provided with at least one pressure released vent, the sealing sheet is appressed on the top end of the float, and the pressure released vent can be closed by the sealing sheet, therefore the sealing sheet can prevent the liquid from infiltrating into the float. When the liquid is heated by the heated plate, the expansion pressure of the float will be released from the pressure released vent.

[0008] Third advantages of the invention include the inner edge of the position limiting element has at least one notch, the notch is helpful to the liquid to enter into the chamber space when the water inlet hole of the water inlet inputs the liquid.

[0009] The above and other objects, features and advantages of the invention will become apparent from the following detailed description taken with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010]

FIG. 1 is a perspective view showing a first preferred embodiment of the invention;

FIG. 2 is an exploded view showing the first preferred embodiment of the invention;

FIG. 3 is a partial exploded view showing the first preferred embodiment of the invention;
FIG. 4 is a partial cross-sectional perspective view along a line A-A of FIG. 1;
FIG. 5 is a cross-sectional view along a line B-B of FIG. 1;
FIG. 6 is a partial enlarged view of the FIG. 5;
FIG. 7 is an operation diagram illustrating the first embodiment of the invention;
FIG. 8 is a partial enlarged view of the FIG. 7;
FIG. 9 is a perspective view showing a second preferred embodiment of the invention;
FIG. 10 is an exploded view showing the second preferred embodiment of the invention;
FIG. 11 is a partial exploded view showing the second preferred embodiment of the invention;
FIG. 12 is a partial cross-sectional perspective view along a line C-C of FIG. 9;
FIG. 13 is a cross-sectional view along a line D-D of FIG. 9;
FIG. 14 is a partial enlarged view of the FIG. 13;
FIG. 15 is an operation diagram illustrating the second embodiment of the invention;
FIG. 16 is a partial enlarged view of the FIG. 15;
FIG. 17 is an exploded view showing the third preferred embodiment of the invention;
FIG. 18 is a partial exploded view showing the third preferred embodiment of the invention;
FIG. 19 is a partial cross-sectional perspective diagram illustrating the third preferred embodiment of the invention;
FIG. 20 is a diagram illustrating the hook is passed through the notch;
FIG. 21 is a diagram illustrating the float is rotated to an angle.

DETAILED DESCRIPTION OF THE INVENTION

[0011] Referring to FIGS. 1 to 8, a humidification chamber in accordance with a first preferred embodiment of the invention comprises a shell body 10, a position limiting element 20, a float 30, a sealing sheet 40 and a heated plate 50; the shell body 10 has a water inlet 11, a gas inlet 12 and a gas outlet 13; the position limiting element 20 has a through hole 21 and an inner edge 23, the position limiting element 20 is fixed on an inside of the water inlet 11; the float 30 has an extending portion 31, a side surface 311 of the extending portion 31 has at least one hook 33, the sealing sheet 40 can be disposed on a top end 312 of the extending portion 31; the heated plate 50 is located below the shell body 10, and the heated plate 50 is used for sealing the shell body 10 to form a chamber space 51; wherein the extending portion 31 can pass through the through hole 21 to enable the hook 33 is located above the inner edge 23; when the chamber space 51 has no liquid, the hook 33 is stopped on the inner edge 23, the float 30 can be suspended on the position limiting element 20 to enable a distance D is formed between the heated plate 50 and a bottom 35 of the float 30; when a liquid is inputted from a water inlet hole 110 of the water inlet 11, the water level of the chamber space 51 will rise to enable the float 30 rises to comply with the water level increasing; when the sealing sheet 40 contacts the water inlet hole 110 of the water inlet 11, the sealing sheet 40 can block the water inlet hole 110 of the water inlet 11 (as shown in FIG. 7 and FIG. 8); the heated plate 50 can heat the liquid which contained in the chamber space 51, and that therefore provide the moisture; when the gas inlet 12 is used for inputting a gas into the chamber space 51, the gas and the moisture will be mixed into a breathing flow having a suitable humidity, the breathing flow can be output from the gas outlet 13.

[0012] Examples of the safety of the first preferred embodiment of the invention will be illustrated below, the water inlet 12 can connect a water storage container (not shown) to replenish the liquid which contained in the chamber space 51; when the liquid of the water storage container is not enough, the water level of the chamber space 51 will significantly fall down, however, the hook 33 can be stopped on the inner edge 23 to enable the float 30 can be suspended on the position limiting element 20 (as shown in FIG. 5 and FIG. 6); even if the chamber space 51 has no liquid at all, the bottom 35 of the float 30 still does not contact the heated plate 50.

[0013] Examples of the combination manner of the float 30 and the sealing sheet 40 will be illustrated below, the float 30 has an upper cover 301 and a container 302, the extending portion 31 is located at the upper cover 301, a fixing post 42 of the sealing sheet 40 can be fixed to a fixing hole 32 of the extending portion 31, and therefore the sealing sheet 40 can be disposed on the top end 312 of the extending portion 31.

[0014] Examples of the pressure release manner of the float 30 will be illustrated below, the float 30 is a hollow container, the top end 312 of the float 30 is provided with at least one pressure released vent 314, the sealing sheet 40 is appressed on the top end 312 of the float 30, and the pressure released vent 314 can be closed by the sealing sheet 40, and that therefore the sealing sheet 40 can prevent the liquid from infiltrating into the float 30. When the liquid is heated by the heated plate 50, the expansion pressure of the float 30 will be released from the pressure released vent 314. Thus, the sealing sheet 40 can prevent the liquid from infiltrating into the float 30, the sealing sheet 40 can also release the expansion pressure of the float 30.

[0015] Examples of the water entering manner of the chamber space 51 will be illustrated below, the side surface 311 of the extending portion 31 has a pair of hooks 33, a diameter d1 formed by the hooks 33 is larger than a diameter d2 formed by the inner edge 23, a gap g is formed between the inner edge 23 and the extending portion 31. When the liquid is inputted from the water inlet hole 110 of the water inlet 11, the liquid will enter into the chamber space 51 by the gap g.

[0016] Examples of the guiding manner of the float 30 will be illustrated below, an inside of the water inlet 11 has an extending tube 111, the position limiting element 20 can be fixed on the extending tube 111 (e.g., close fit), an inner wall of the extending tube 111 has a plurality of guiding ribs 113, and that therefore a center line C1 of the extending portion 31 can be aimed at the water inlet 110 of the water inlet 11, the guiding ribs 113 can guide the movement of the float 30.

[0017] Examples of the sealing manner of the heated plate 50 and the shell body 10 will be illustrated below, the shell body 10 has an annular edge 15, the annular edge 15 is sealed with an edge 55 of the heated plate 50, a sealing ring 60 is disposed between the annular edge 15 and the edge 55 of the heated plate 50; wherein the sealing ring 60 can be wrapped on the annular edge 15.

[0018] Referring to FIGS. 9 to 16, a humidification chamber in accordance with a second embodiment of the invention comprises a shell body 10, a position limiting element 20, a float 30, a sealing sheet 40 and a heated plate 50; the shell body 10 has a water inlet 11, a gas inlet 12 and a gas outlet 13; the position limiting element 20 has a through hole 21 and an inner edge 23, the position limiting element 20 is fixed on an inside of the water inlet 11, the inner edge 23 has at least one stopper portion 23a; the float 30 has an extending portion 31, a side surface 311 of the extending portion 31 has at least one longitudinal groove 34, the longitudinal groove 34 is provided with a hook 33a, the sealing sheet 40 can be disposed on a top end 312 of the extending portion 31; the heated plate 50 is located below the shell body 10, and the heated plate 50 is used for sealing the shell body 10 to form a chamber space 51; wherein the extending portion 31 can pass through the through hole 21 to enable the stopper portion 23a is located within the longitudinal groove 34, and the hook 33a is located above the stopper portion 23a; when the chamber space 51 has no liquid, the hook 33a is stopped on the stopper portion 23a, the float 30 can be suspended on the position limiting element 20 to enable a distance D is formed between the heated plate 50 and a bottom 35 of the float 30; when a liquid is inputted from a water inlet hole 110 of the water inlet 11, the water level of the chamber space 51 will rise to enable the float 30 rises to comply with the water level increasing; when the sealing sheet 40 contacts the water inlet hole 110 of the water inlet 11, the sealing sheet 40 can block the water inlet hole 110 of the water inlet 11 (as shown in FIG. 15 and FIG. 16); the heated plate 50 can heat the liquid which contained in the chamber space 51, and that therefore provide the moisture; when the gas inlet 12 is used for inputting a gas into the chamber space 51, the gas and the moisture will be mixed into a breathing flow having a suitable humidity, the breathing flow can be output from the gas outlet 13.

[0019] Examples of the safety of the second embodiment of the invention will be illustrated below, the water inlet 12 can connect a water storage container (not shown) to replenish the liquid which contained in the chamber space 51; when the liquid of the water storage container is not enough, the water level of the chamber space 51 will significantly fall down, however, the hook 33a can be stopped on the stopper portion 23a to enable the float 30 can be suspended on the position limiting element 20 (as shown in FIG. 13 and FIG. 14); even if the chamber space 51 has no liquid at all, a bottom 35 of the float 30 still does not contact the heated plate 50.

[0020] Examples of the combination manner of the float 30 and the sealing sheet 40 will be illustrated below, the float 30 has an upper cover 301 and a container 302, the extending portion 31 is located at the upper cover 301, a fixing post 42 of the sealing sheet 40 can be fixed to a fixing hole 32 of the extending portion 31, and therefore the sealing sheet 40 can be disposed on the top end 312 of the extending portion 31.

[0021] Examples of the pressure release manner of the float 30 will be illustrated below, the float 30 is a hollow container, the top end 312 of the float 30 is provided with at least one pressure released vent 314, the sealing sheet 40 is appressed on the top end 312 of the float 30, and the pressure released vent 314 can be closed by the sealing sheet 40, and that therefore the sealing sheet 40 can prevent the liquid from infiltrating into the float 30. When the liquid is heated by the heated plate 50, the expansion pressure of the float 30 will be released from the pressure released vent 314. Thus, the sealing sheet 40 can prevent the liquid from infiltrating into the float 30, the sealing sheet 40 can also release the expansion pressure of the float 30.

[0022] Examples of the water entering manner of the chamber space 51 will be illustrated below, the side surface 311 of the extending portion 31 has a pair of longitudinal grooves 34 and a pair of hooks 33a, a gap g is formed between the inner edge 23 and the extending portion 31. When the liquid is inputted from the water inlet hole 110 of the water inlet 11, the liquid will enter into the chamber space 51 by the gap g.

[0023] Examples of the guiding manner of the float 30 will be illustrated below, an inside of the water inlet 11 has an extending tube 111, the position limiting element 20 can be fixed on the extending tube 111 (e.g., close fit), an inner wall of the extending tube 111 has a plurality of guiding ribs 113, and that therefore a center line C1 of the extending portion 31 can be aimed at the water inlet 110 of the water inlet 11, the guiding ribs 113 can guide the movement of the float 30.

[0024] Referring to FIG. 1, FIGS. 5 to 8, FIGS. 17 to 21, a humidification chamber in accordance with a third preferred embodiment of the invention comprises a shell body 10, a position limiting element 20, a float 30, a sealing sheet 40 and a heated plate 50; the shell body 10 has a water inlet 11, a gas inlet 12 and a gas outlet 13, an inside of the water inlet 11 has an extending tube 111, an inner wall of the extending tube 111 has a plurality of guiding ribs 113; the position limiting element 20 has a through hole 21 and an inner edge 23, the inner edge 23

is provided with at least one notch 26; the float 30 has an extending portion 31, a side surface 311 of the extending portion 31 has at least one hook 33, the sealing sheet 40 can be disposed on a top end 312 of the extending portion 31; the heated plate 50 is located below the shell body 10, and the heated plate 50 is used for sealing the shell body 10 to form a chamber space 51; wherein the extending portion 31 can pass through the through hole 21, the hook 33 can pass through the notch 26 (as shown in FIG. 18 and FIG. 20), and the float 30 can be rotated to an angle to enable the hook 33 is located at an inside of the inner edge 23 (as shown in FIG. 20 and FIG. 21); the position limiting element 20 can be fixed on the extending tube 111, therefore the hook 33 and the notch 26 can be separated by the guiding ribs 113 of the extending tube 111 (as shown in FIG. 19); when the chamber space 51 has no liquid, the hook 33 is stopped on the inner edge 23, the float 30 can be suspended on the position limiting element 20 to enable a distance D is formed between the heated plate 50 and a bottom 35 of the float 30; when a liquid is inputted from a water inlet hole 110 of the water inlet 11, the water level of the chamber space 51 will rise to enable the float 30 rises to comply with the water level increasing; when the sealing sheet 40 contacts the water inlet hole 110 of the water inlet 11, the sealing sheet 40 can block the water inlet hole 110 of the water inlet 11 (as shown in FIG. 7 and FIG. 8); the heated plate 50 can heat the liquid which contained in the chamber space 51, and that therefore provide the moisture; when the gas inlet 12 is used for inputting a gas into the chamber space 51, the gas and the moisture will be mixed into a breathing flow having a suitable humidity, the breathing flow can be output from the gas outlet 13.

[0025] Examples of the water entering manner of the chamber space 51 will be illustrated below, a gap g is formed between the inner edge 23 and the extending portion 31. When the liquid is inputted from the water inlet hole 110 of the water inlet 11, the liquid will enter into the chamber space 51 by the gap g and the notch 26.

Claims

1. A humidification chamber having suspension type float, the humidification chamber comprising:

   a shell body (10), the shell body (10) has a water inlet (11), a gas inlet (12) and a gas outlet (13);
   a position limiting element (20), the position limiting element (20) has a through hole (21) and an inner edge (23), the position limiting element (20) is fixed on an inside of the water inlet (11);
   a float (30) having an extending portion (31), a side surface (311) of the extending portion (31) has at least one hook (33);
   a sealing sheet (40), the sealing sheet (40) can be disposed on a top end (312) of the extending portion (31); and
   a heated plate (50), the heated plate (50) is located below the shell body (10), and the heated plate (50) is used for sealing the shell body (10) to form a chamber space (51);
   wherein the extending portion (31) can pass through the through hole (21) to enable the hook (33) is located above the inner edge (23); a water inlet hole (110) of the water inlet (11) can be used for inputting a liquid, the water level of the chamber space (51) will rise to enable the float (30) rises to comply with the water level increasing; when the water inlet hole (110) of the water inlet (11) is contacted with the sealing sheet (40), the water inlet hole (110) of the water inlet (11) can be blocked by the sealing sheet (40); when the hook (33) is stopped on the inner edge (23), the float (30) can be suspended on the position limiting element (20), and that therefore a distance (D) can be formed between the heated plate (50) and a bottom (35) of the float (30).

2. The humidification chamber having suspension type float of claim 1, wherein the float (30) has an upper cover (301) and a container (302), the extending portion (31) is located at the upper cover (301), a fixing post (42) of the sealing sheet (40) can be fixed to a fixing hole (32) of the extending portion (31).

3. The humidification chamber having suspension type float of claim 1, wherein the float (30) is a hollow container, the top end (312) of the float (30) is provided with at least one pressure released vent (314), the sealing sheet (40) is appressed on the top end (312) of the float (30), and the pressure released vent (314) can be closed by the sealing sheet (40), and that therefore the sealing sheet (40) can prevent the liquid from infiltrating into the float (30); when the liquid is heated by the heated plate (50), the expansion pressure of the float (30) will be released from the pressure released vent (314).

4. The humidification chamber having suspension type float of claim 1, wherein the side surface (311) of the extending portion (31) has a pair of hooks (33), a diameter (d1) formed by the hooks (33) is larger than a diameter (d2) formed by the inner edge (23), a gap (g) is formed between the inner edge (23) and the extending portion (31); when the liquid is inputted from the water inlet hole (110) of the water inlet (11), the liquid will enter into the chamber space (51) by the gap (g).

5. The humidification chamber having suspension type float of claim 1, wherein an inside of the water inlet (11) has an extending tube (111), the position limiting element (20) can be fixed on the extending tube (111), an inner wall of the extending tube (111) has

a plurality of guiding ribs (113), and that therefore a center line (C1) of the extending portion (31) can be aimed at the water inlet (110) of the water inlet (11), the guiding ribs (113) can guide the movement of the float (30).

6. A humidification chamber having suspension type float, the humidification chamber comprising:

a shell body (10), the shell body (10) has a water inlet (11), a gas inlet (12) and a gas outlet (13);
a position limiting element (20), the position limiting element (20) has a through hole (21) and an inner edge (23), the position limiting element (20) is fixed on an inside of the water inlet (11), the inner edge (23) has at least one stopper portion (23a);
a float (30) having an extending portion (31), a side surface (311) of the extending portion (31) has at least one longitudinal groove (34), the longitudinal groove (34) is provided with a hook (33a)
a sealing sheet (40), the sealing sheet (40) can be disposed on a top end (312) of the extending portion (31); and
a heated plate (50), the heated plate (50) is located below the shell body (10), and the heated plate (50) is used for sealing the shell body (10) to form a chamber space (51);
wherein the extending portion (31) can pass through the through hole (21) to enable the stopper portion (23a) is located within the longitudinal groove (34), and the hook (33a) is located above the stopper portion (23a); a water inlet hole (110) of the water inlet (11) can be used for inputting a liquid, the water level of the chamber space (51) will rise to enable the float (30) rises to comply with the water level increasing; when the water inlet hole (110) of the water inlet (11) is contacted with the sealing sheet (40), the water inlet hole (110) of the water inlet (11) can be blocked by the sealing sheet (40); when the hook (33a) is stopped on the stopper portion (23a), the float (30) can be suspended on the position limiting element (20), and that therefore a distance (D) can be formed between the heated plate (50) and a bottom (35) of the float (30).

7. The humidification chamber having suspension type float of claim 6, wherein the float (30) has an upper cover (301) and a container (302), the extending portion (31) is located at the upper cover (301), a fixing post (42) of the sealing sheet (40) can be fixed to a fixing hole (32) of the extending portion (31).

8. The humidification chamber having suspension type float of claim 6, wherein the float (30) is a hollow container, the top end (312) of the float (30) is provided with at least one pressure released vent (314), the sealing sheet (40) is appressed on the top end (312) of the float (30), and the pressure released vent (314) can be closed by the sealing sheet (40), and that therefore the sealing sheet (40) can prevent the liquid from infiltrating into the float (30); when the liquid is heated by the heated plate (50), the expansion pressure of the float (30) will be released from the pressure released vent (314).

9. The humidification chamber having suspension type float of claim 6, wherein the side surface (311) of the extending portion (31) has a pair of longitudinal grooves (34) and a pair of hooks (33), a gap (g) is formed between the inner edge (23) and the extending portion (31); when the liquid is inputted from the water inlet hole (110) of the water inlet (11), the liquid will enter into the chamber space (51) by the gap (g).

10. The humidification chamber having suspension type float of claim 6, wherein an inside of the water inlet (11) has an extending tube (111), the position limiting element (20) can be fixed on the extending tube (111), an inner wall of the extending tube (111) has a plurality of guiding ribs (113), and that therefore a center line (C1) of the extending portion (31) can be aimed at the water inlet (110) of the water inlet (11), the guiding ribs (113) can guide the movement of the float (30).

11. A humidification chamber having suspension type float, the humidification chamber comprising:

a shell body (10), the shell body (10) has a water inlet (11), a gas inlet (12) and a gas outlet (13), an inside of the water inlet (11) has an extending tube (111), an inner wall of the extending tube (111) has a plurality of guiding ribs (113);
a position limiting element (20), the position limiting element (20) has a through hole (21) and an inner edge (23), the inner edge (23) is provided with at least one notch (26);
a float (30) having an extending portion (31), a side surface (311) of the extending portion (31) has at least one hook (33);
a sealing sheet (40), the sealing sheet (40) can be disposed on a top end (312) of the extending portion (31); and
a heated plate (50), the heated plate (50) is located below the shell body (10), and the heated plate (50) is used for sealing the shell body (10) to form a chamber space (51);
wherein the extending portion (31) can pass through the through hole (21), the hook (33) can pass through the notch (26), and the float (30) can be rotated to an angle to enable the hook (33) is located at an inside of the inner edge (23); the position limiting element (20) can be fixed

on the extending tube (111), therefore the hook (33) and the notch (26) can be separated by the guiding ribs (113) of the extending tube (111); when a water inlet hole (110) of the water inlet (11) is contacted with the sealing sheet (40), the water inlet hole (110) of the water inlet (11) can be blocked by the sealing sheet (40); when the hook (33) is stopped on the inner edge (23), the float (30) can be suspended on the position limiting element (20), and that therefore a distance (D) can be formed between the heated plate (50) and a bottom (35) of the float (30).

12. The humidification chamber having suspension type float of claim 11, wherein the float (30) has an upper cover (301) and a container (302), the extending portion (31) is located at the upper cover (301), a fixing post (42) of the sealing sheet (40) can be fixed to a fixing hole (32) of the extending portion (31).

13. The humidification chamber having suspension type float of claim 11, wherein the float (30) is a hollow container, the top end (312) of the float (30) is provided with at least one pressure released vent (314), the sealing sheet (40) is appressed on the top end (312) of the float (30), and the pressure released vent (314) can be closed by the sealing sheet (40), and that therefore the sealing sheet (40) can prevent the liquid from infiltrating into the float (30); when the liquid is heated by the heated plate (50), the expansion pressure of the float (30) will be released from the pressure released vent (314).

14. The humidification chamber having suspension type float of claim 11, wherein a gap (g) is formed between the inner edge (23) and the extending portion (31); when the liquid is inputted from the water inlet hole (110) of the water inlet (11), the liquid will enter into the chamber space (51) by the gap (g) and the notch (26).

15. The humidification chamber having suspension type float of claim 11, wherein the shell body (10) has an annular edge (15), the annular edge (15) is sealed with an edge (55) of the heated plate (50), a sealing ring (60) is disposed between the annular edge (15) and the edge (55) of the heated plate (50), the sealing ring (60) can be wrapped on the annular edge (15).

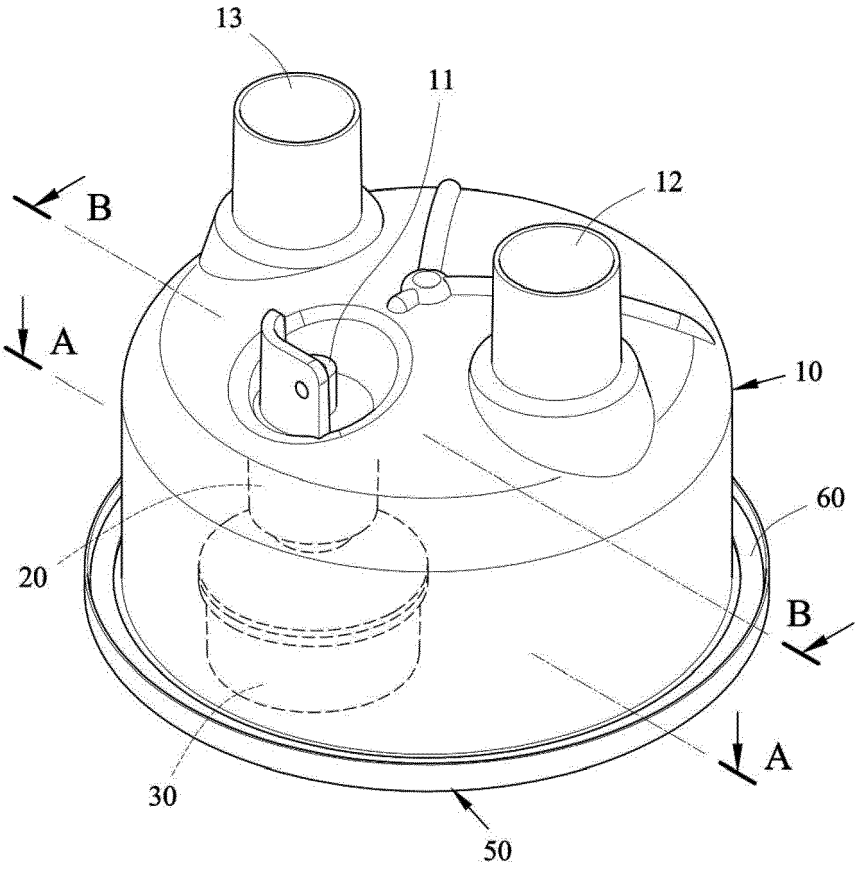

FIG. 1

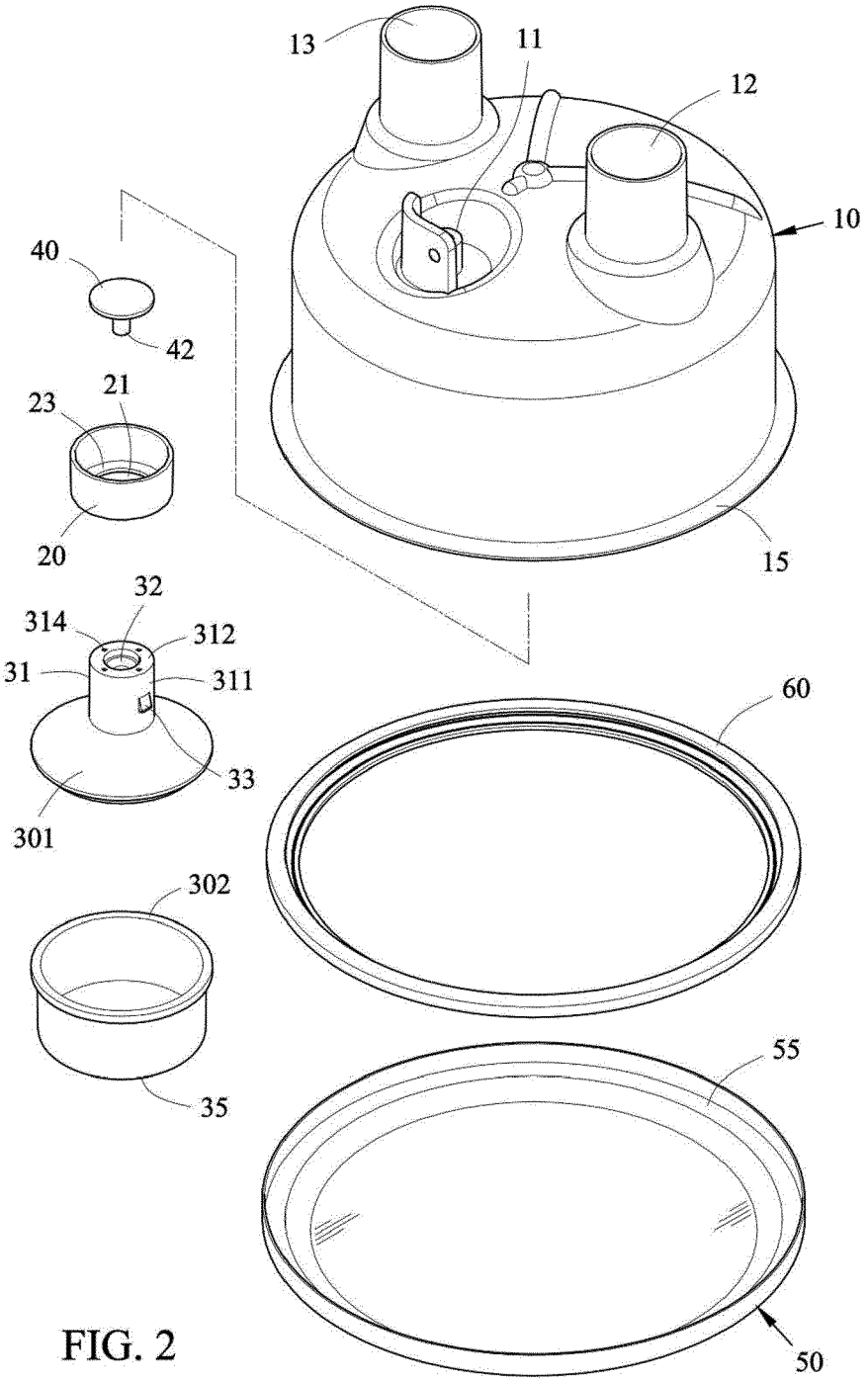

FIG. 2

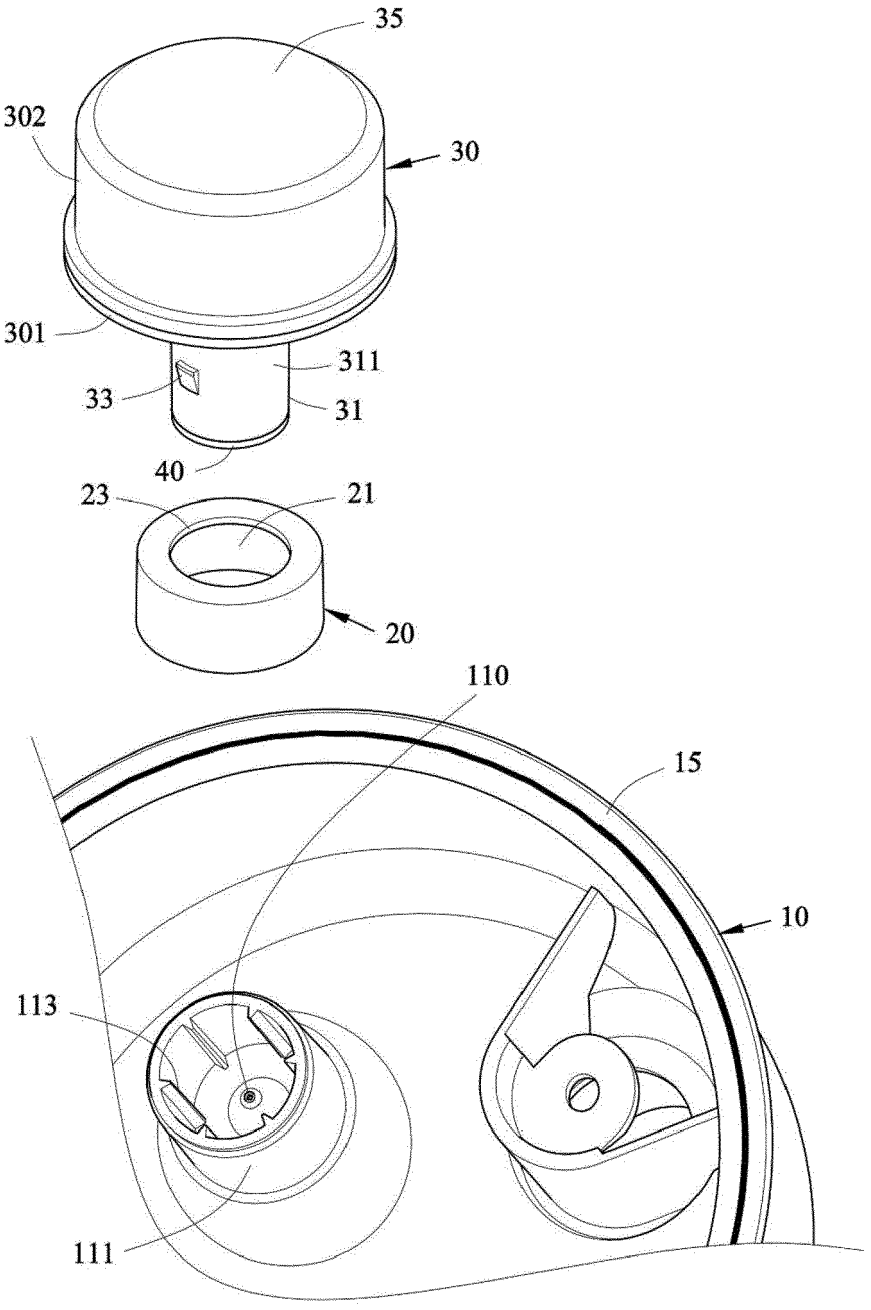

FIG. 3

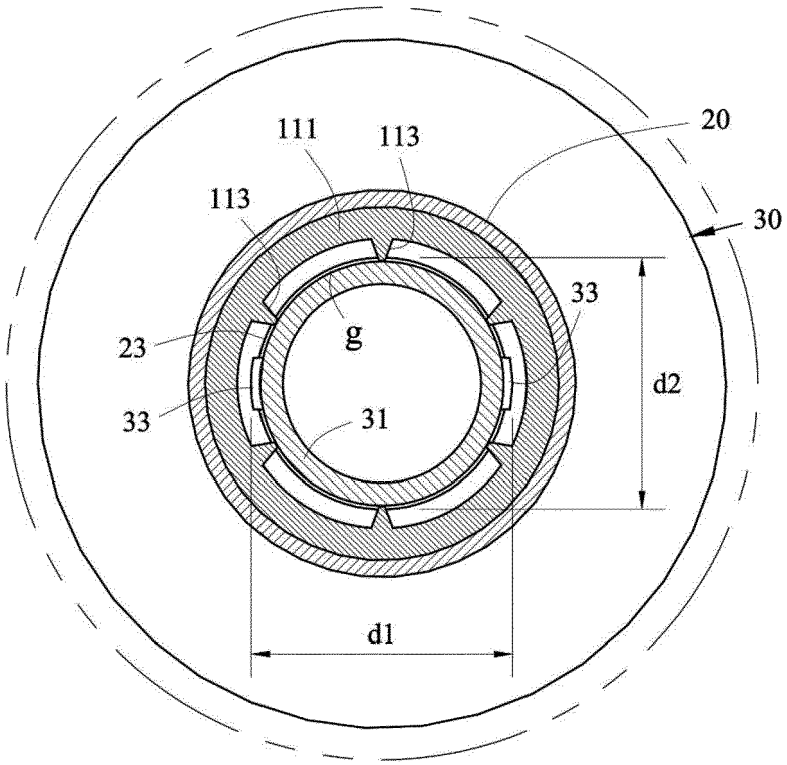

FIG. 4

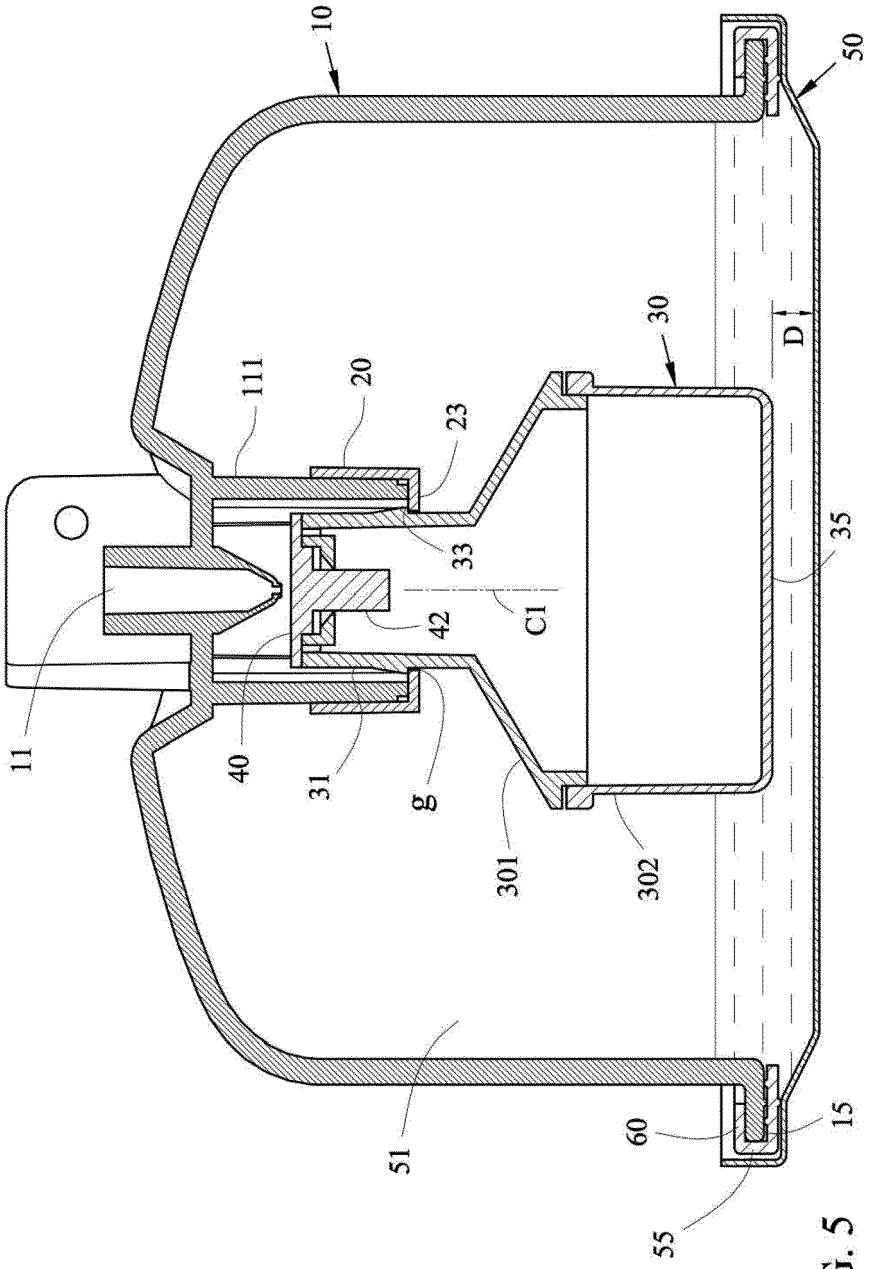

FIG. 5

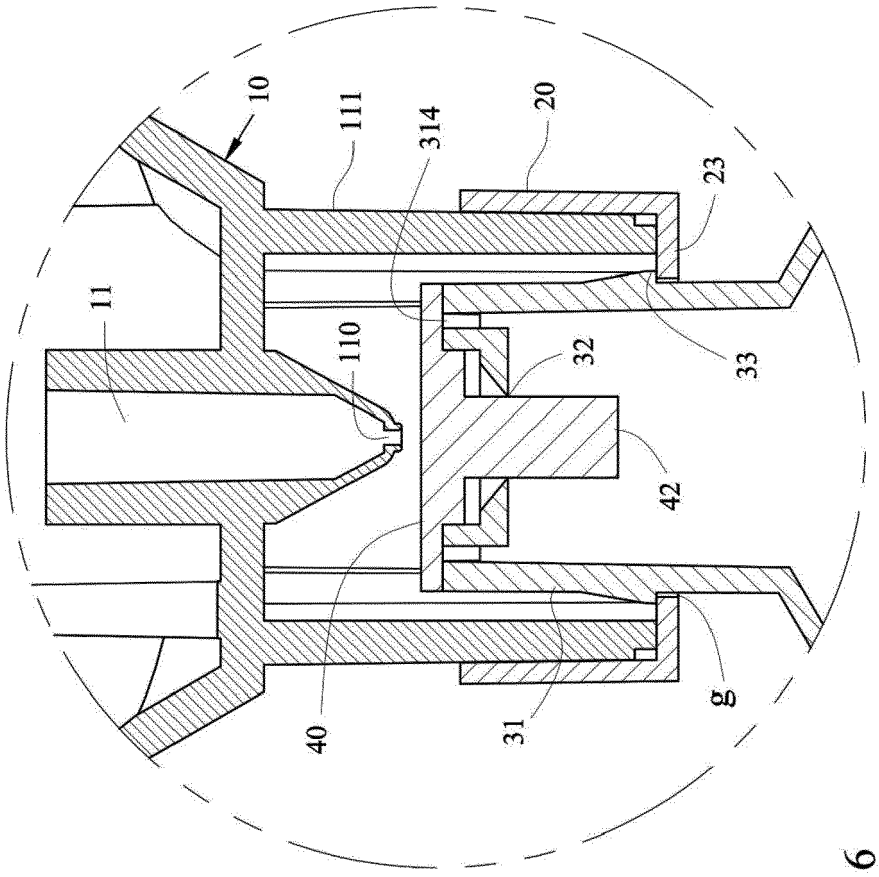

FIG. 6

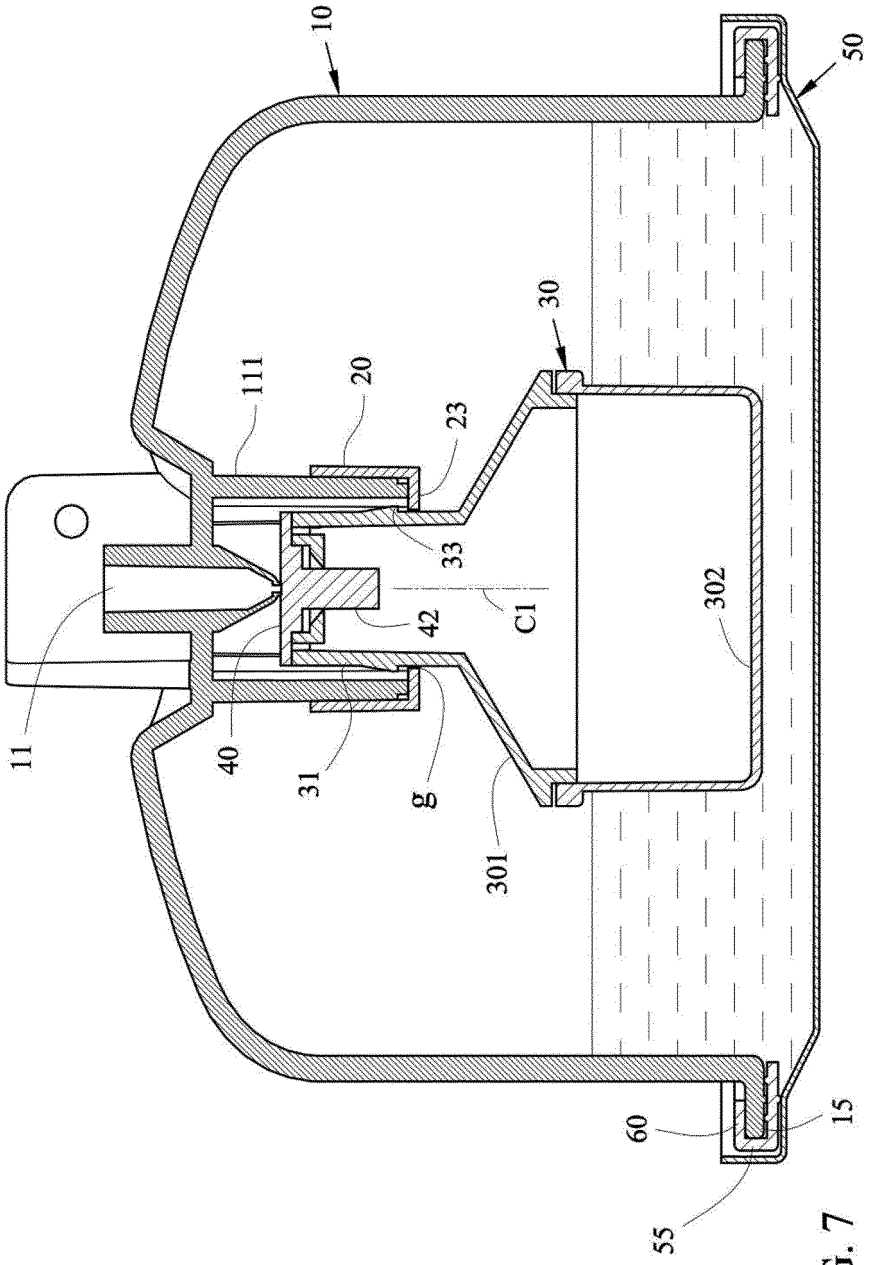

FIG. 7

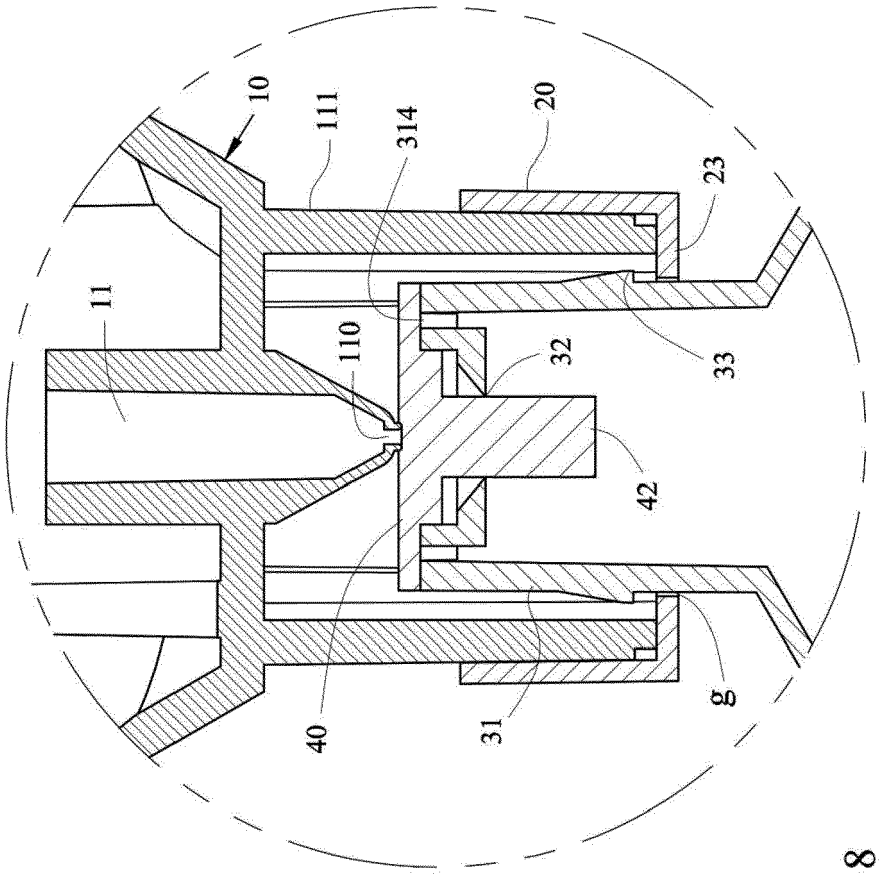

FIG. 8

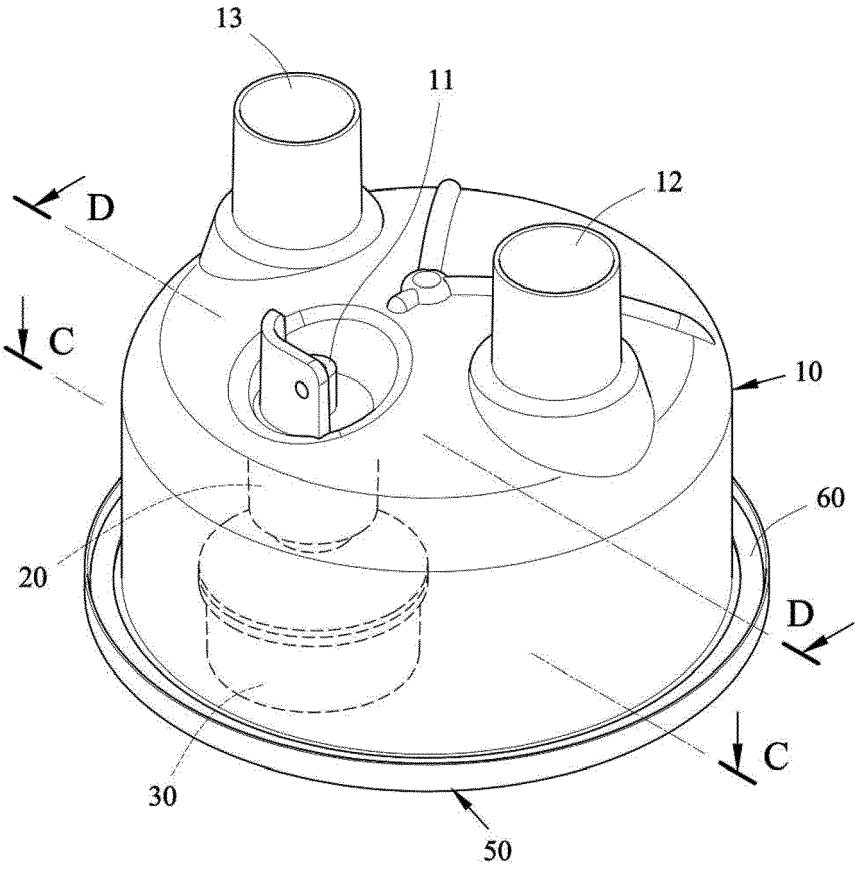

FIG. 9

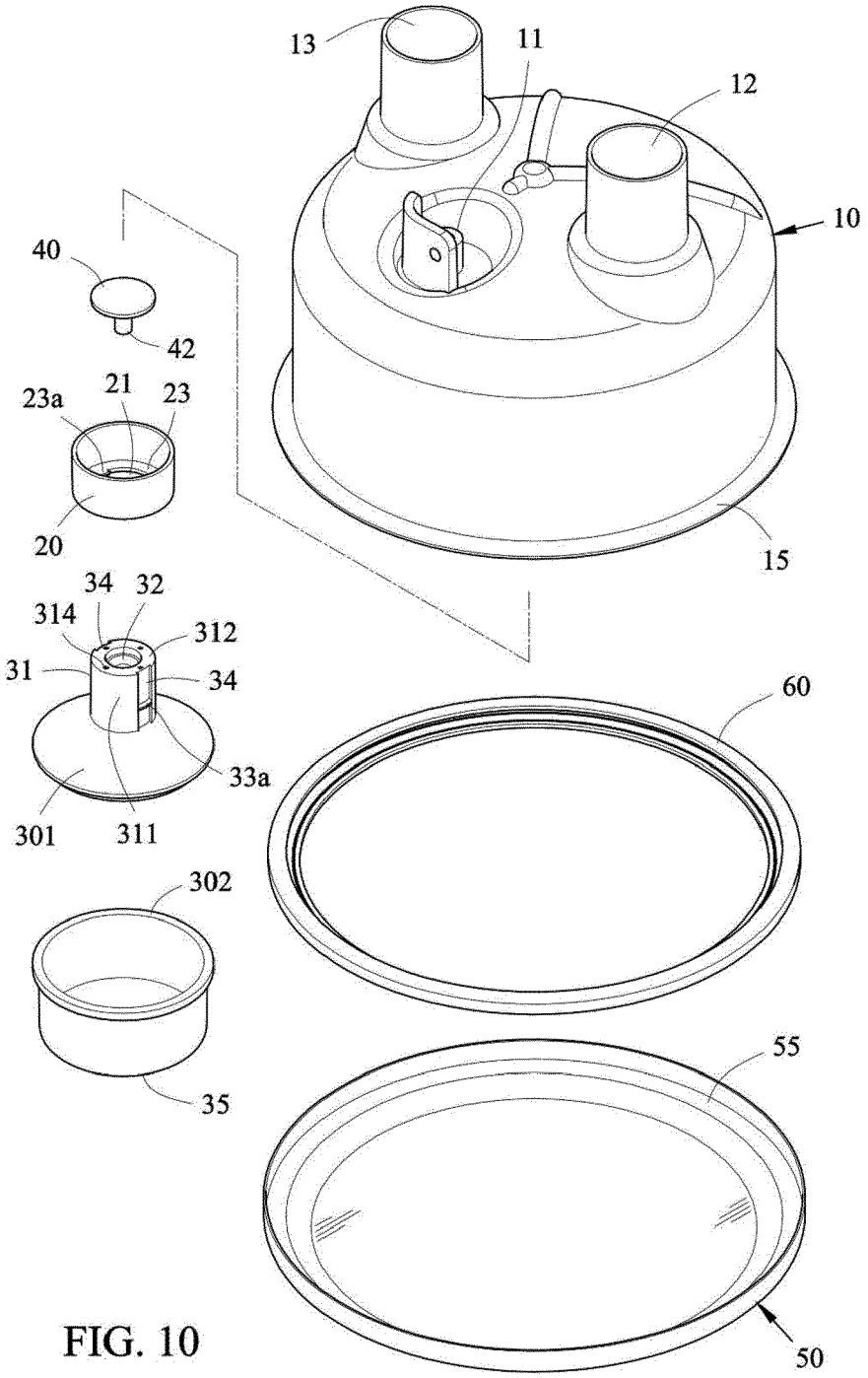
13
11
12
10
40
42
23a
21
23
20
15
34
32
314
312
31
34
33a
301
311
60
302
35
55
50

FIG. 10

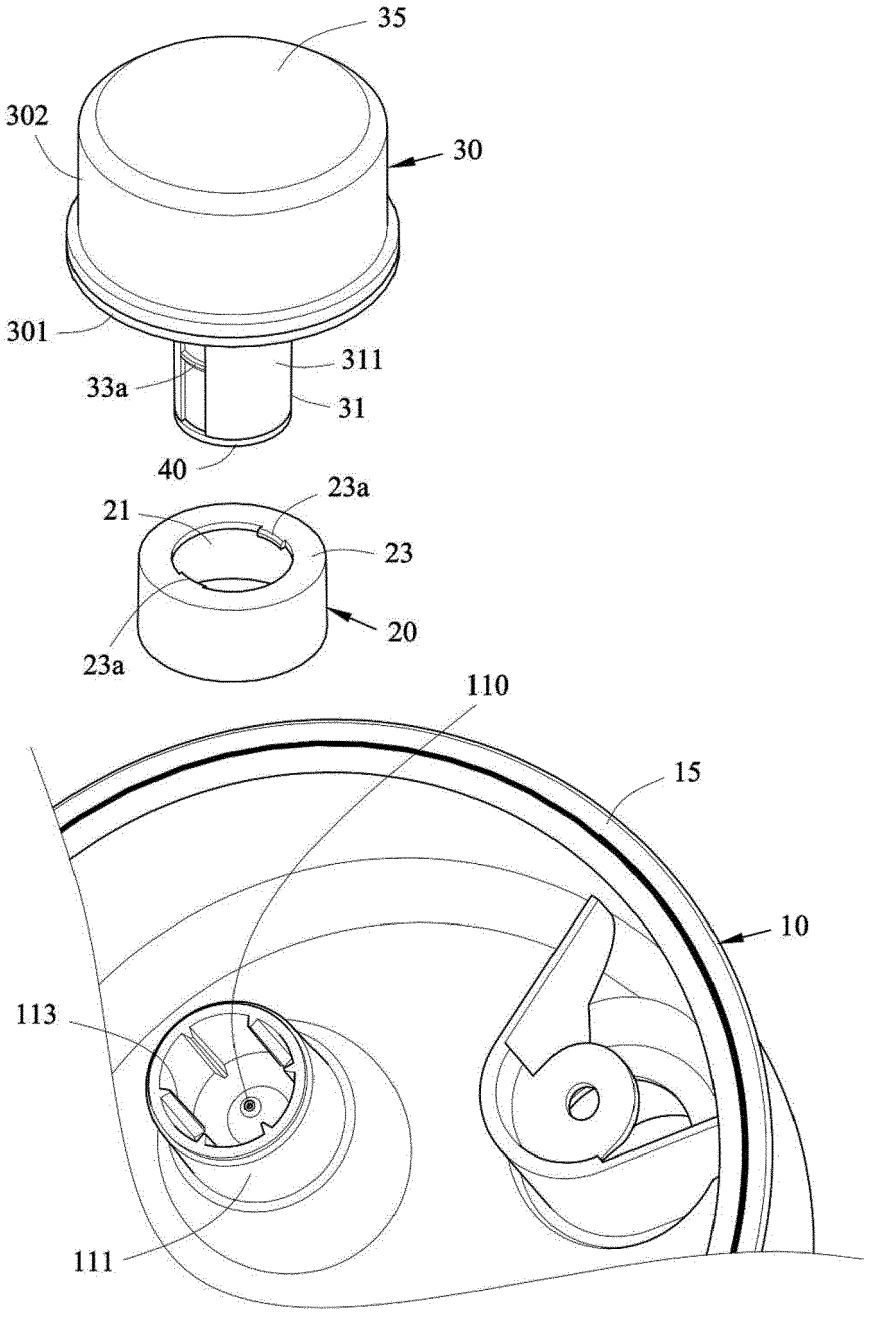

FIG. 11

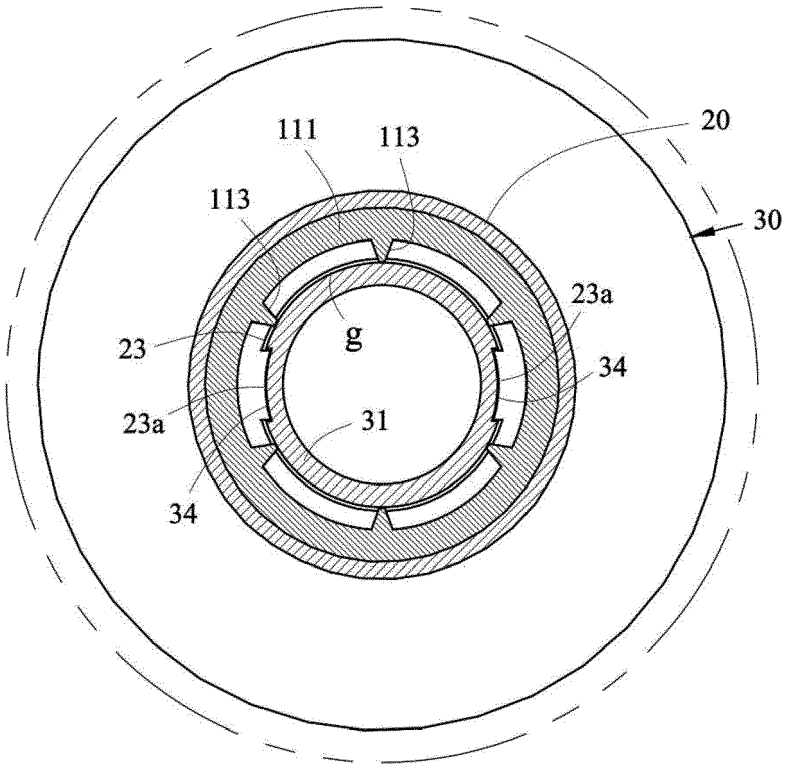

FIG. 12

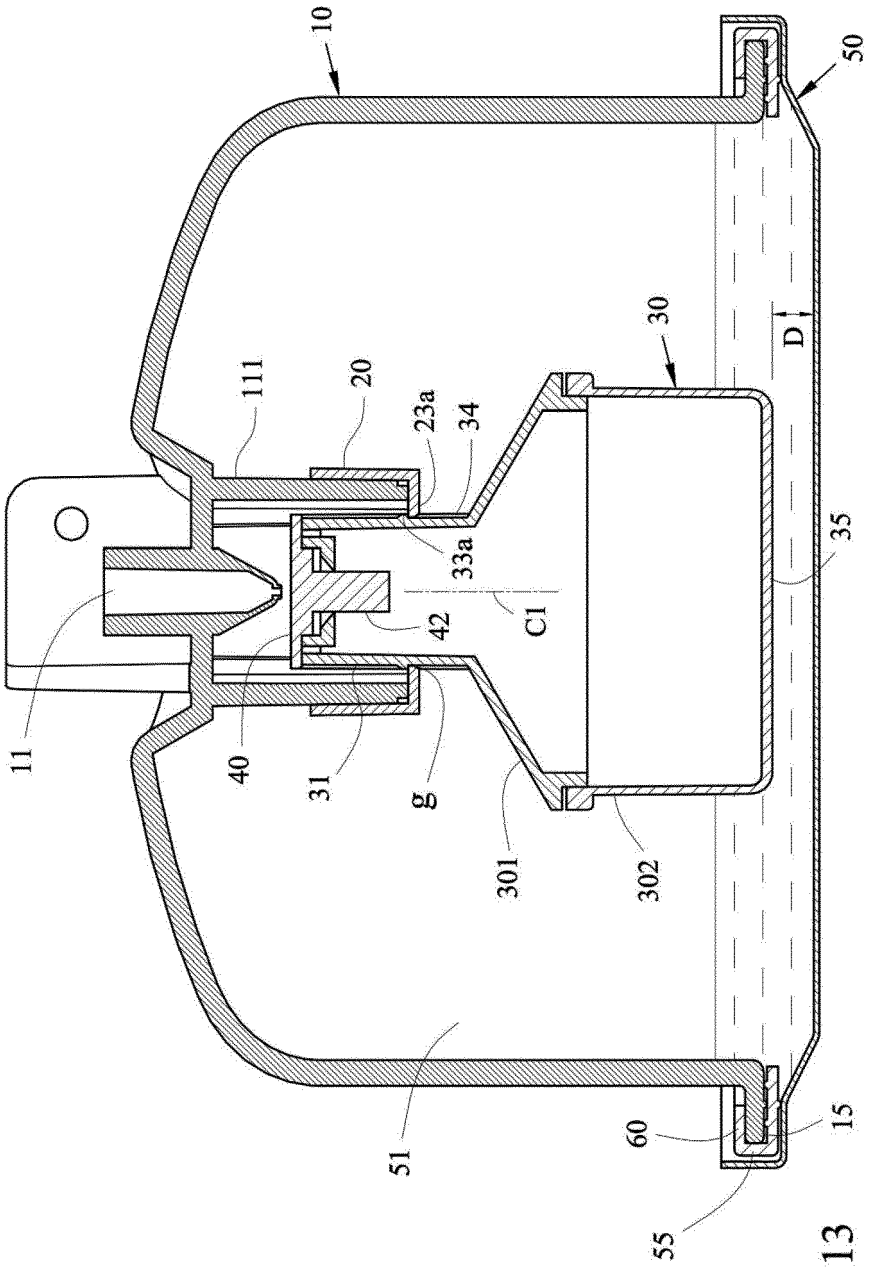

FIG. 13

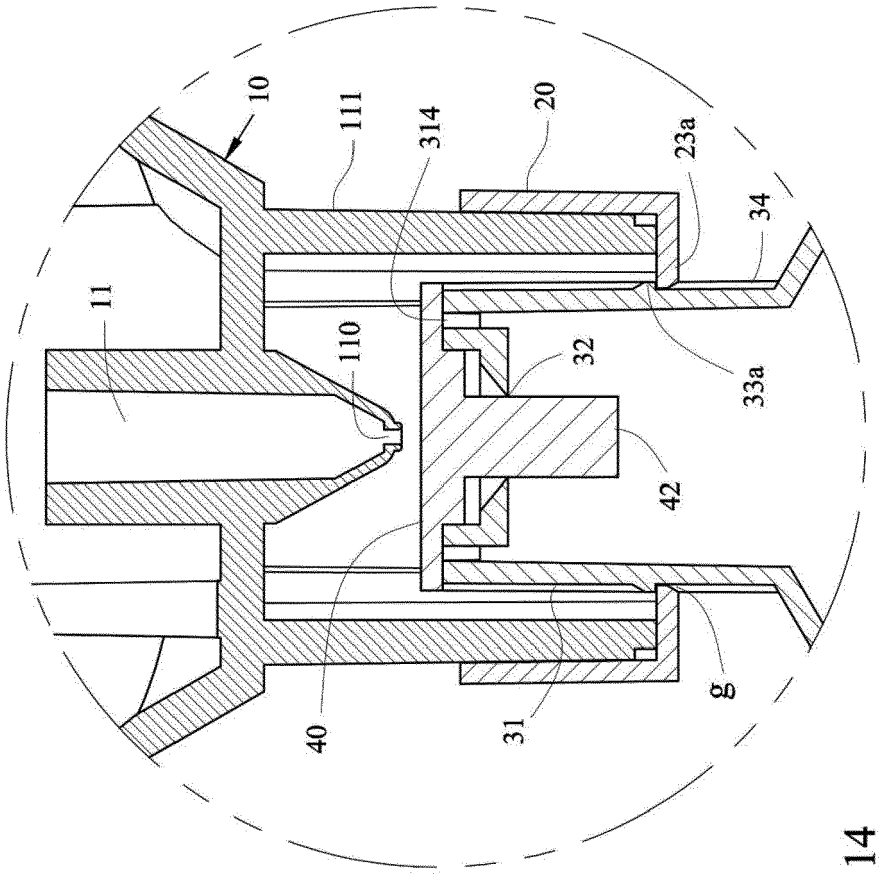

FIG. 14

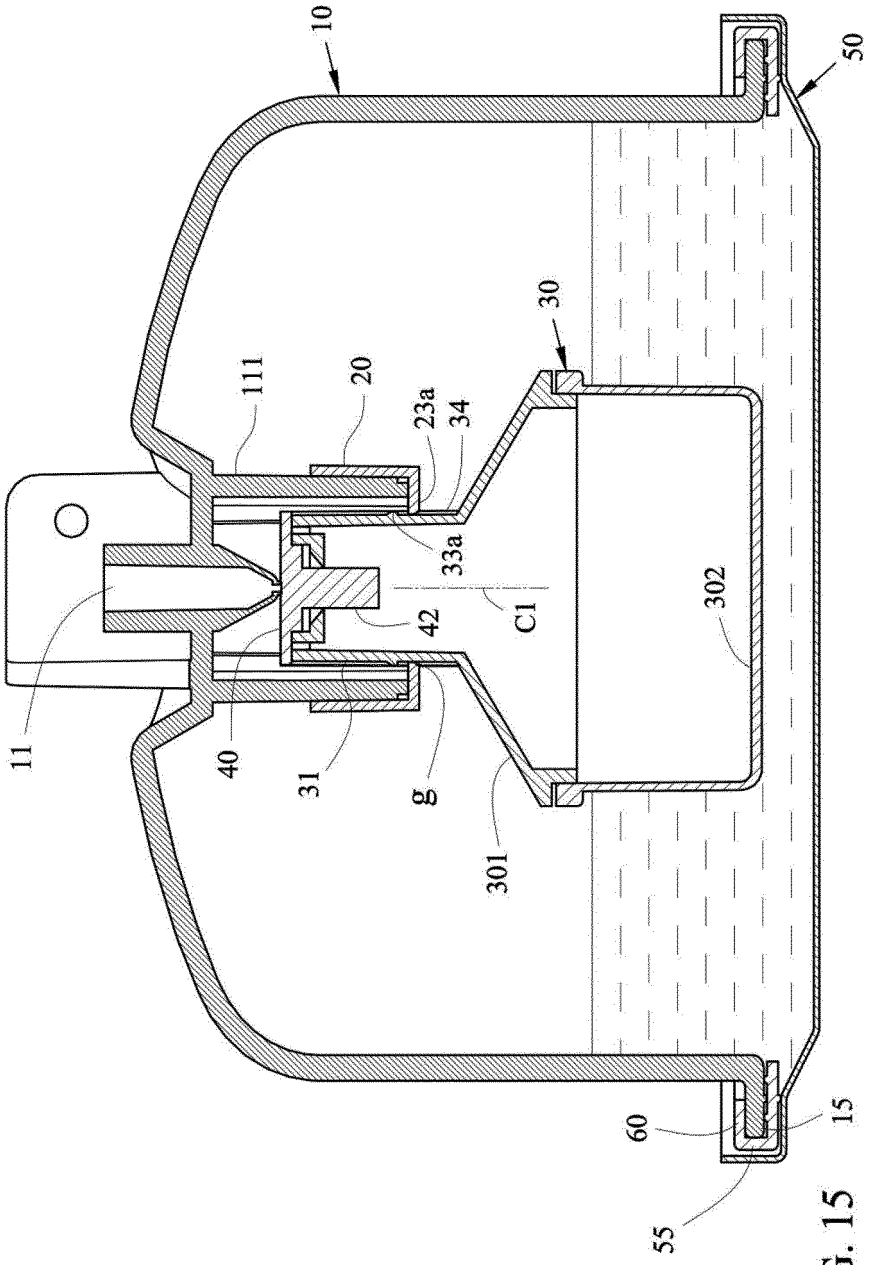

FIG. 15

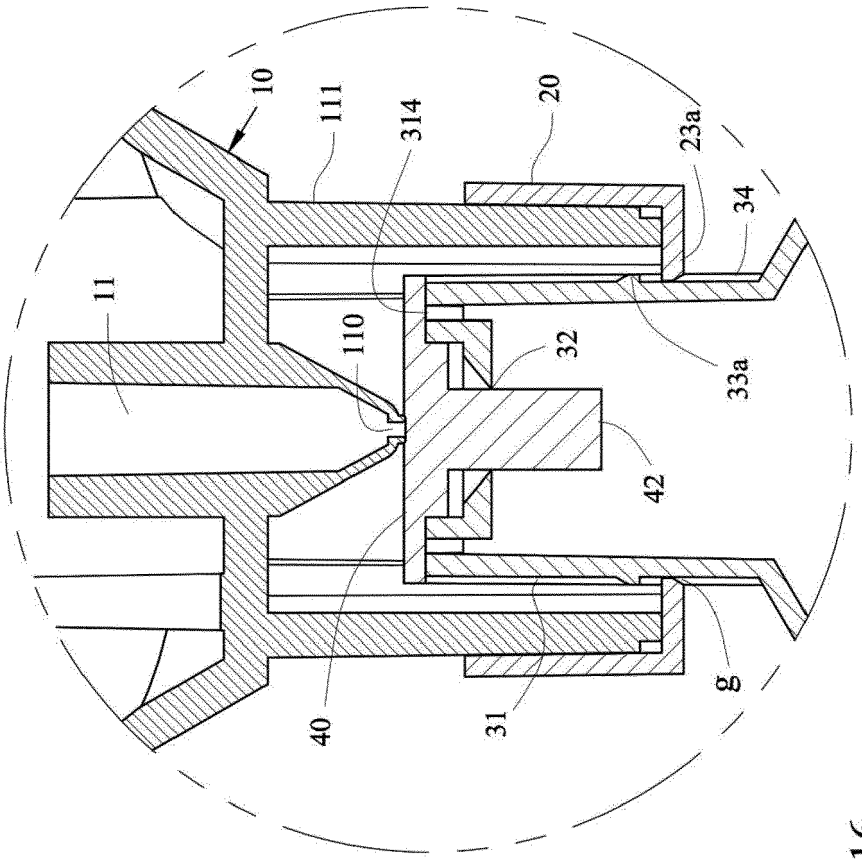

FIG. 16

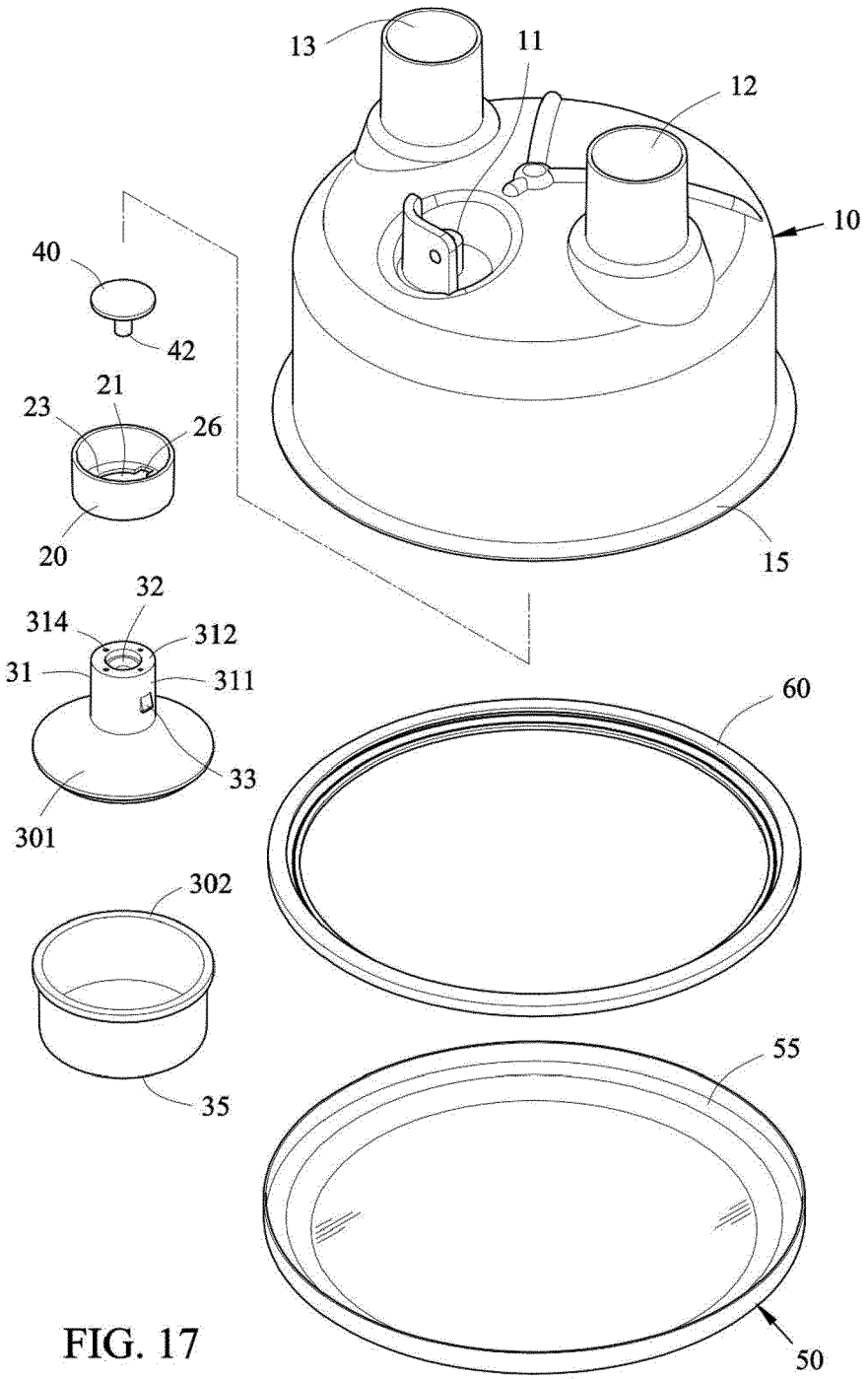
13
11
12
10
40
42
21
23
26
20
15
32
314
312
31
311
33
301
60
302
55
35
50

FIG. 17

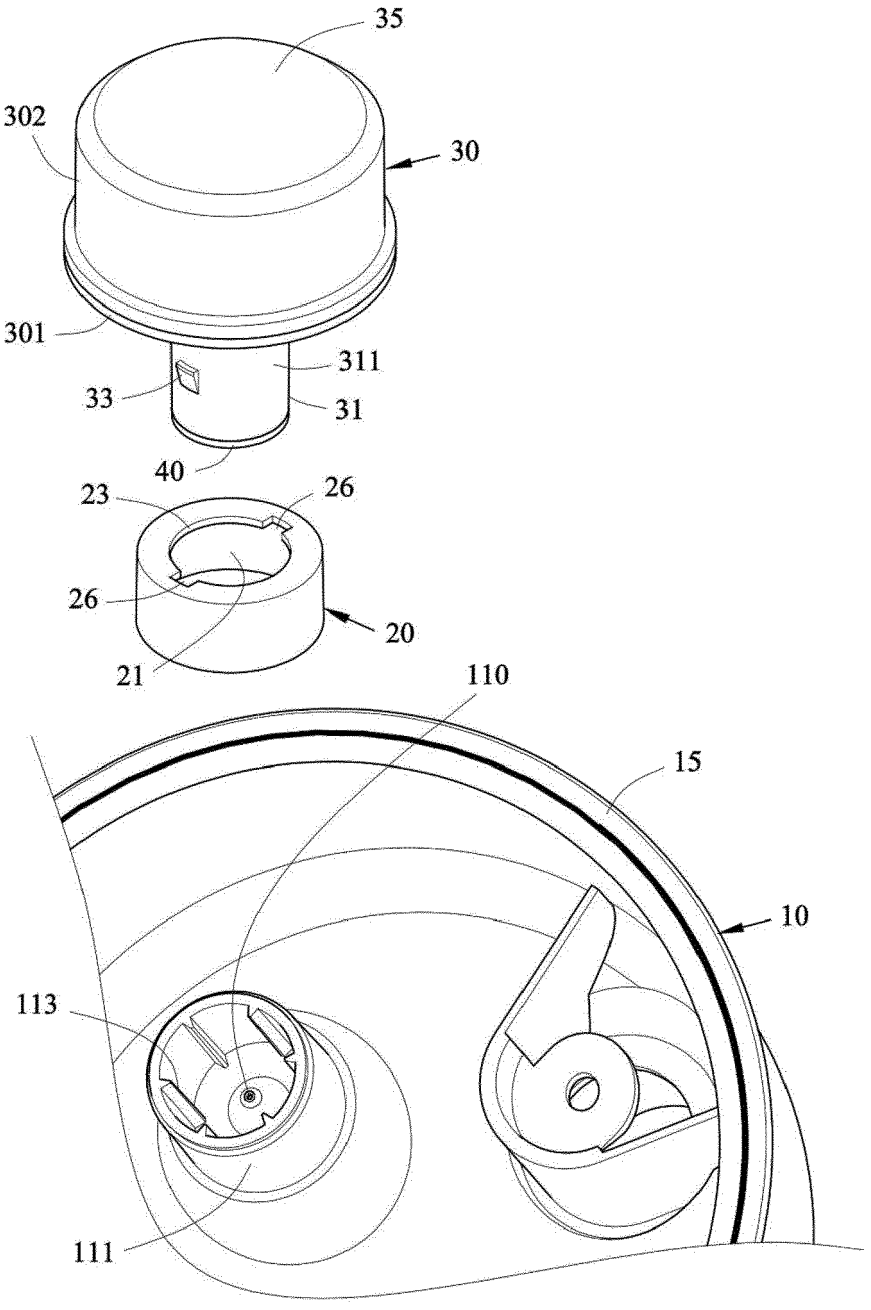

FIG. 18

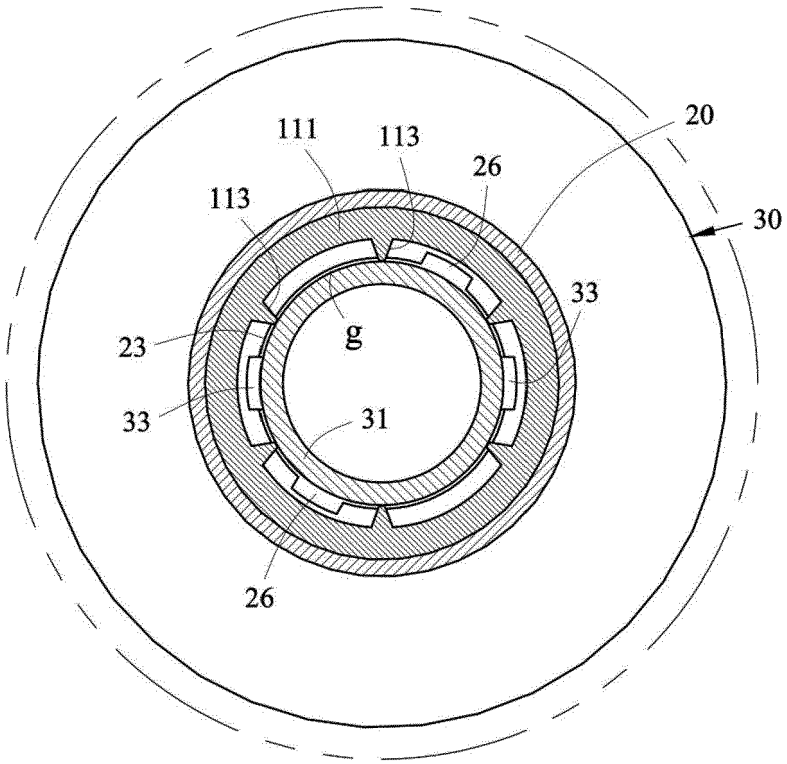

FIG. 19

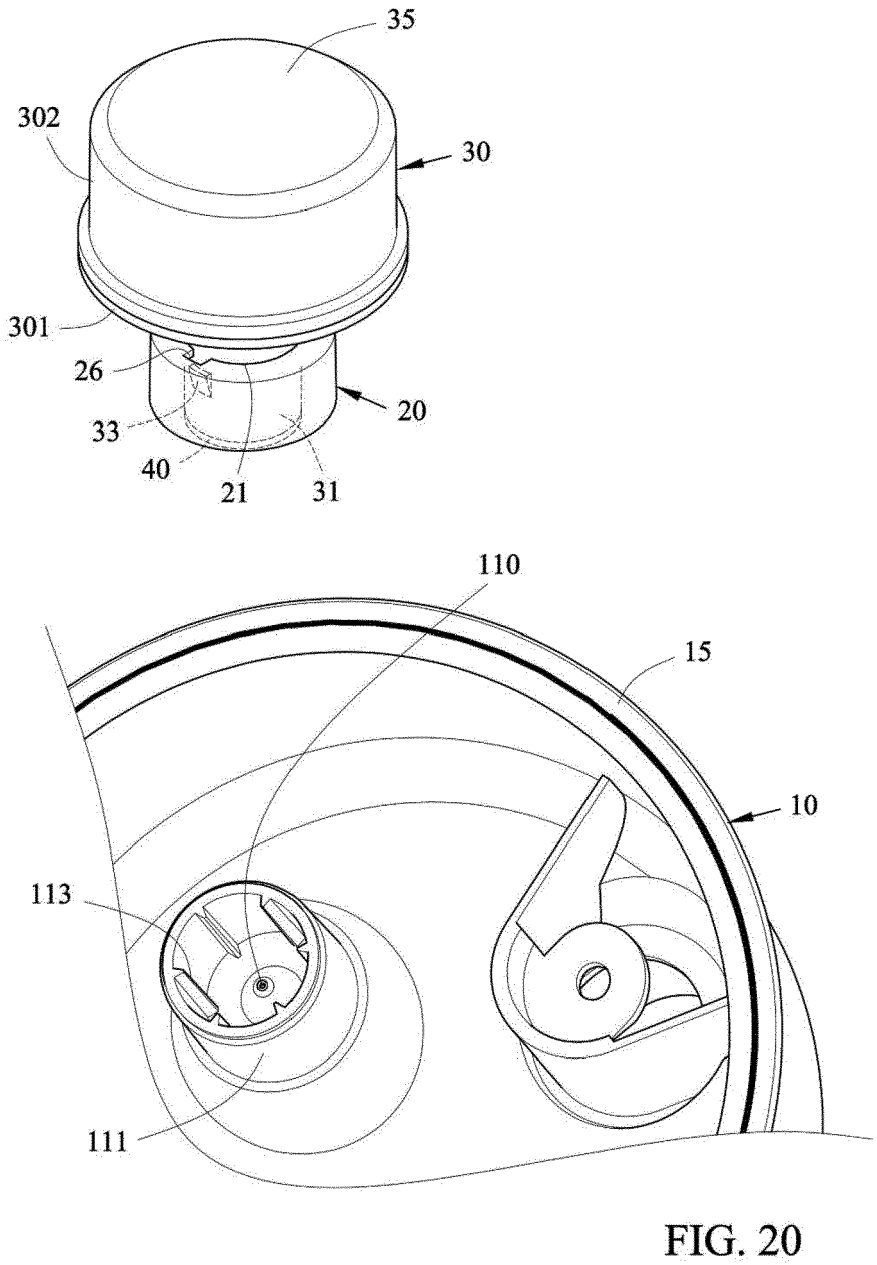

FIG. 20

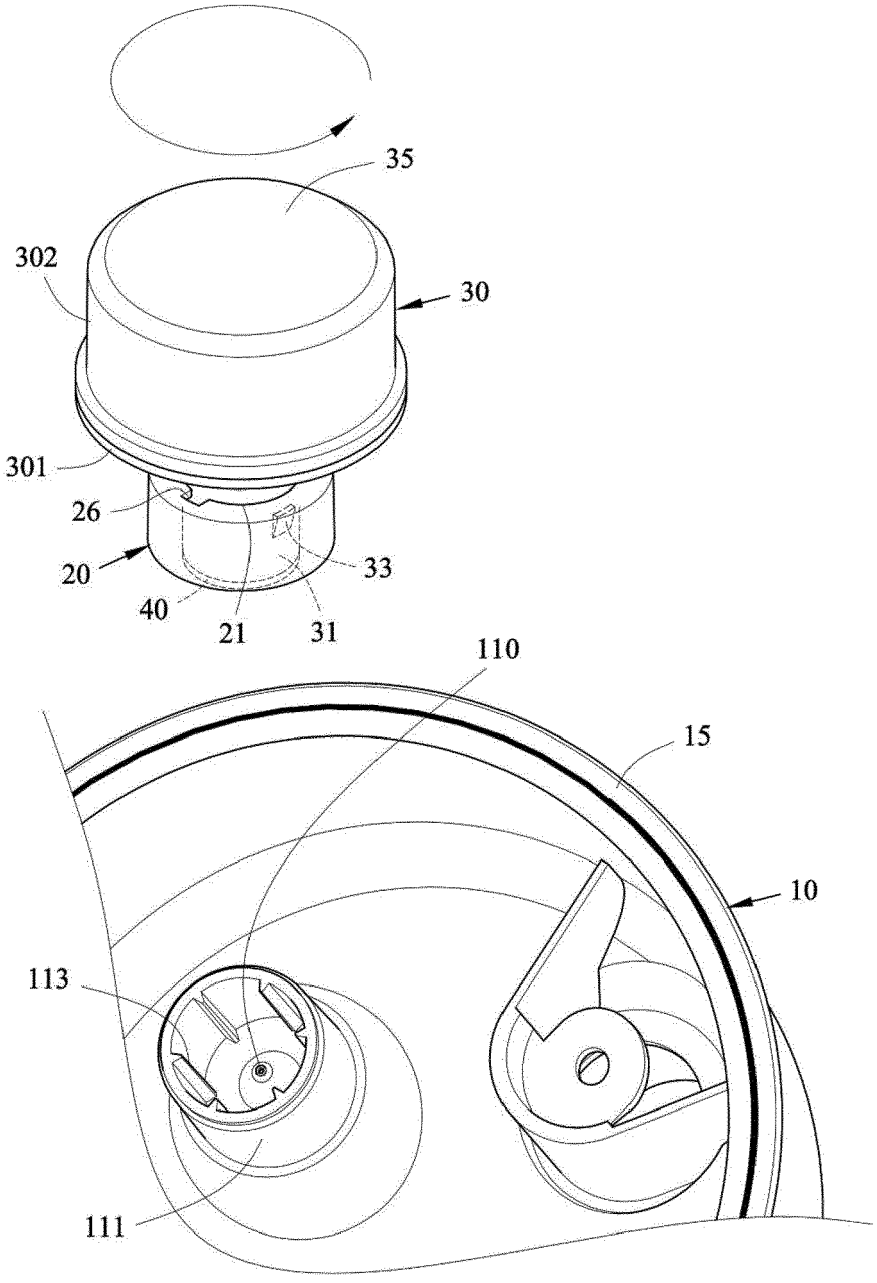

FIG. 21

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 17 19 0640

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 2008/017892 A1 (INTERSURGICAL AG [LI]; PAYNE SIMON ROBERT [GB]; FERNANDO KEETHAN [GB]) 14 February 2008 (2008-02-14)	1,4,5	INV. A61M16/16 G01F23/76
Y	* figures 1-4 *	2,3	A61M16/10
A	* page 8, line 5 - line 30 * * page 10, line 14 - page 13, line 16 * * page 15, line 20 - page 16, line 3 *	6-15	
Y,D	WO 2008/027670 A1 (MEDEX CARDIO PULMONARY INC [US]; BRADLEY KEITH J [US]; SANDERS WALTER) 6 March 2008 (2008-03-06) * figures 1-3 * * passages relative to Figs 1-3 *	2,3	
A	EP 2 119 466 A1 (DEAS S R L [IT]) 18 November 2009 (2009-11-18) * the whole document *	1-15	
A	EP 1 733 751 A1 (INTERSURGICAL AG [LI]) 20 December 2006 (2006-12-20) * the whole document *	1-15	TECHNICAL FIELDS SEARCHED (IPC)
A	US 6 170 510 B1 (KING TIMOTHY J [US] ET AL) 9 January 2001 (2001-01-09) * the whole document *	1-15	A61M G01F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	16 March 2018	Cecchini, Stefano

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

Europäisches Patentamt
European Patent Office
Office européen des brevets

Application Number
EP 17 19 0640

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☒ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

Europäisches Patentamt
European Patent Office
Office européen des brevets

LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 17 19 0640

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-15

A humidification chamber comprising a shell body, a position limiting element comprising an inner edge, a float provided with at least one hook on a side surface of an extending portion, a sealing sheet and a heated plate.

1.1. claims: 1-5

The subject-matter of claims 1-5 essentially discloses: a humidification chamber comprising a shell body, a position limiting element comprising an inner edge, a float provided with at least one hook on a side surface of an extending portion, a sealing sheet and a heated plate, wherein the at least one hook, in use, is located above the inner edge.

1.2. claims: 6-10

The subject-matter of claims 6-10 essentially discloses: a humidification chamber comprising a shell body, a position limiting element comprising an inner edge, a float provided with at least one hook on a side surface of an extending portion, a sealing sheet and a heated plate, wherein the at least one hook is placed on a longitudinal groove on the side surface of the extending portion, the at least one hook is stopped on a stopper portion located on the inner edge.

1.3. claims: 11-15

The subject-matter of claims 11-15 essentially discloses: a humidification chamber comprising a shell body, a position limiting element comprising an inner edge, a float provided with at least one hook on a side surface of an extending portion, a sealing sheet and a heated plate, wherein an inlet of the humidification chamber has an extending tube having guiding ribs formed on an inner wall, the position limiting element is fixed on the extending tube, and the at least one hook passes through at least one notch located at the inner edge, and, in use, the hook and the notch are separated by the guiding ribs.

Please note that all inventions mentioned under item 1, although not necessarily linked by a common inventive concept, could be searched without effort justifying an additional fee.

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 17 19 0640

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

16-03-2018

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2008017892 A1	14-02-2008	AU 2007283221 A1	14-02-2008
		EP 2056910 A1	13-05-2009
		ES 2432050 T3	29-11-2013
		GB 2440829 A	13-02-2008
		JP 5346288 B2	20-11-2013
		JP 2010500071 A	07-01-2010
		US 2010170511 A1	08-07-2010
		WO 2008017892 A1	14-02-2008
WO 2008027670 A1	06-03-2008	AU 2007290261 A1	06-03-2008
		EP 2056912 A1	13-05-2009
		JP 5398868 B2	29-01-2014
		JP 2010502926 A	28-01-2010
		JP 2012185825 A	27-09-2012
		US 2008054500 A1	06-03-2008
		WO 2008027670 A1	06-03-2008
EP 2119466 A1	18-11-2009	NONE	
EP 1733751 A1	20-12-2006	EP 1733751 A1	20-12-2006
		GB 2427156 A	20-12-2006
US 6170510 B1	09-01-2001	CA 2284983 A1	12-11-1998
		DE 69818070 D1	16-10-2003
		DE 69818070 T2	24-06-2004
		EP 1007872 A1	14-06-2000
		US 5944044 A	31-08-1999
		US 6170510 B1	09-01-2001
		WO 9850717 A1	12-11-1998

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 7722016 B **[0002]**
- AU 2007290261 B2 **[0002]**
- EP 2056912 A1 **[0002]**
- JP 5398868 B **[0002]**
- WO 2008027670 A1 **[0002]**